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ABSTRACT

The controversy over what divergent thinking tests measure was addressed by conducting a study of the relationship between divergent thinking and vocational interests. Forty-one above-average fifth graders were administered Pattern and Line Meanings a year before they took the American College Testing Program (ACT) Interest Inventory. Divergent fluency significantly predicted interest in "business contact," and this correlation was significantly greater than the correlation between fluency and interest in the creative arts. The prediction of interest in persuasive over creative vocations was attributed to a strong relationship between divergent thinking and invention, but a marginal relationships between divergent thinking and creativity. A four-page list of references concludes the document. (Author/JAZ)

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Divergent Thinking and Interest in Persuasive Vocations

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Abstract

The controversy over what divergent thinking tests measure was addressed by conducting a study of the relationship between divergent thinking and vocational interests. Forty one above-average fifth graders were administered Pattern and Line Meanings a year before they took the ACT Interest Inventory. Divergent fluency significantly predicted interest in "business contact" (.52, $p < .001$), and this correlation was significantly greater than the correlation between fluency and interest in the creative arts (.23, n.s.). The prediction of interest in persuasive over creative vocations was attributed to a strong relationship between divergent thinking and invention, but a marginal (.2 to .3) relationship between divergent thinking and creativity.

Divergent Thinking and Interest in Persuasive Vocations

Since Binet proposed tests of imagination (1896), divergent-thinking tests have been offered as measures of creativity. Just what they measure is uncertain, however, because of the variability of the correlations with criteria of creativity in different fields. They appear to predict productivity in sales (Wallace, 1961), and creativity in advertising, public relations and writing (Elliott, 1964; Torrance, 1972), but not creativity in other fields, including science and most of the fine arts (e.g., Torrance, 1972; Getzels & Csikszentmihalyi, 1976). Why tests purported to measure creativity should predict achievement in some domains of creative behavior but not others is a significant problem, not only in research on creativity, but in education, where such tests are sometimes recommended for use in the selection of creative talent.

The literature cited above suggests that the predictive validity of divergent-thinking tests is a function of vocational area. One approach to the problem of identifying what divergent-thinking tests

measure involves distinguishing problem finding from problem solving, combining a theory of problem finding and solving with a theory of careers, and correlating divergent thinking with career preferences. In this manner, several domains of investigation can be unified to address the problem.

The theory which guided the research was developed from a theory that coordinates freedom vs. constraint in problem finding vs. problem solving. This coordination of dimensions allows one to

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Insert Figure 1 about here

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distinguish both theoretically and empirically the conditions of response on a divergent-thinking test from the conditions of a creative performance (Wakefield, 1985b).

In theory, divergent thinking can be conceptualized as one type of invention. Invention can be defined as meaningful response to conditions of constraint in the choice of a problem but freedom in its solution. A meaningful response is any response which makes progress towards a solution. In short,

inventive thinking involves making progress towards a solution under closed-problem and open-solution conditions.

Creative thinking can be conceptualized as meaningful response to freedom to find a problem and freedom in its solution. It involves making progress towards a solution under open-problem and open-solution conditions. Creative thinking is thus related to divergent thinking though unconstraining conditions in problem solving, but distinguished from it through freedom vs. constraint in problem finding.

This theory bears a curious ressemblance to a theory of occupations that has been developed by Prediger (1981, 1982). He found that on the one hand, occupations could be distinguished through their orientation towards people or things, and on the other, through their orientation towards ideas or data. The orthogonal "map" that resulted primarily distingushes four of Holland's (1973) personality types and four occupational scales of the ACT Interest Inventory: the artistic type (identified with the Creative Arts scale), the enterprising type (identified with the Business Contact scale), the conventional type

(identified with the Business Organization scale), and the investigative type (identified with the Scientific scale).

What is particularly interesting is the juxtapositon of responses to problem finding and solving conditions with the dimensions of Prediger's map (see Figure 2). The differences in predictive

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Insert Figure 2 about here

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validity become understandable when one hypothesizes that as a form of invention, divergent thinking should predict interest in business contact over interest in the creative arts. The juxtaposition of theories has the potential to generate several other interesting hypotheses, but only this one addresses the problem under study.

A test of this hypothesis occurred in the follow-up to an assessment of creative performance. The second author suggested that we administer the ACT Interest Inventory to the sixth grade students whom we had tested a year earlier with a creative performance measure, divergent tests, and intelligence measures.

Investigation of the ACT instrument led to our realization that the Vocational Map had an unusually good "fit" to the theory of problematic conditions, so we tested not only a first group of sixth graders (Wakefield, 1985a) but a second group, who had also taken divergent-thinking tests and intelligence measures a year before. Our hypothesis was that divergent thinking would predict interest in business contact over interest in the creative arts.

Method

Subjects

Participants for the study were drawn from two sixth-grade classes at the university laboratory school. Forty-seven pupils had been tested with divergent-thinking measures in the fifth grade, but 2 had moved during the year, 2 repeatedly received an indication that their interests were unclear, and printouts of standard scores could not be obtained from 2 others. The remaining 41 participants (16 M and 25 F) became the subjects of the study.

Since school admission was somewhat selective, the subjects were above average in intelligence. Intelligence was assessed by the WISC-R Vocabulary

subtest at the time of initial testing. The average score of the 41 subjects was at the 82nd percentile of the test, with 6 scoring below the 50th percentile and 6 at or above the 98th percentile.

Instruments and Measures

The divergent-thinking tests used were abbreviated versions of Pattern Meanings and Line Meanings from the Wallach & Kogan (1965) battery. These divergent-thinking exercises each consist of a series of 10 drawings which the subject is asked to interpret in a game-like atmosphere without time limits. Subjects are encouraged to come up with as many interpretations for each drawing as possible. In our abbreviated version of the tests, only the first five drawings in each set were used.

Responses could be scored for fluency of association (average number of responses) and originality (statistical rarity), but recent research suggests that fluency is the only psychometrically adequate dimension (Hocevar, 1979; Runco, 1985, 1986). Fluency scores from the two tests intercorrelated so highly that they were combined, and the reliability of the combined score was estimated by the Spearman-Brown

prophecy formula to be .92. Only the combined fluency score was used in later calculations.

The vocational interest instrument used was the Unisex edition of the ACT Interest Inventory (UNIACT). This 90-item inventory measures interest in the six vocational areas (creative arts, science, technical, business organization, business contact, and social service) which correpond with the six personality types identified by Holland in his theory of careers.

Of particular interest were the Creative Arts and Business Contact scales. According to the ACT Interest Inventory technical report (Lamb & Prediger, 1981), the Creative Arts scales measures interest in expressing oneself through activities such as painting, designing, singing, dancing, and writing, as well as the artistic appreciation of such activities. The Business Contact scale measures interest in persuading, influencing, directing and motivating others. The activities appropriate to this area include sales supervision and aspects of business management. The two scales are reported to intercorrelate marginally (.27). In our study, the intercorrelation was slightly lower (.18).

This and the other intercorrelations obtained in

our study are found in Table 1. Only some of the

Insert Table 1 about here

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values for the Science and Social Service scales differed from the norm, indicating that the assessment of interests on most scales was valid.

Procedures

The divergent thinking and intelligence measures were individually administered in the spring of the fifth-grade year by two research assistants, then the ACT Interest Inventory was administered a year later to small groups through the DISCOVER microcomputer program. The inventory administration was supervised by one of the research assistants, who answered questions and obtained from subjects a printout of stanines in each area of vocational interest, and repeated the program for a few students who did not obtain stanines on their first try. A copy of the printout of scores was given to each subject. Stanines from the interest inventory were then correlated with the fluency scores obtained a year earlier.

Results

The divergent fluency scores proved to be both significantly related to interest in business contact, and more closely related to interest in business contact than interest in the creative arts. Interest scales and their correlations with divergent thinking fluency were Creative Arts (.23, n.s.), Science (-.04, n.s.), Technical (.23, n.s.), Business Organization (.34, $p < .05$), Business Contact (.52, $p < .001$), and Social Service (.09, n.s.). Four of the correlations, and their relation to the Vocational Map coordinates, are displayed in Figure 3.

Insert Figure 3 about here

The difference between the correlational values for fluency/Creative Arts and fluency/Business Contact was tested as recommended in Glass and Stanley (1970, pp. 313-314), except a one-tailed test of significance was used. The difference proved to be significant ($z = 1.68$, $p < .05$), signaling that the correlation between fluency scores and interest in business contact was significantly higher than the correlation between

fluency scores and interest in the creative arts. In other words, divergent fluency predicted interest in business contact over interest in the creative arts.

Discussion

The hypothesis was confirmed by the data, but the data take on added significance when arrayed on the quadrants of the Vocational Map (Figure 3). As one might have hypothesized, divergent fluency bears a marginal relationship (.2 to .3) to interest in business organization as well as to interest in the creative arts. The fluency/Technical value also fits into the expected pattern, but the fluency/Science and the fluency/Social Service values are suspiciously low. The questionable significance of these two correlations does not invalidate the other relationships, of course, or decrease their usefulness in determining what the fluency score measures.

It appears that the fluency score correlates more highly with interest in business contact because it measures a thinking skill which has been broadly defined as invention. Inventiveness appears to be the cognitive response to conditions which call for solving set problems in new ways. Such conditions appear to be

predominant in environments which call for selling or leading others. According to Holland (1973, p. 32), the problems posed in such environments are set either by the organization (e.g., organizational goals) or self-interest (e.g., personal goals of money, power, or status). The solution of these problems is much less constricted than the actual problems, resulting in susceptibility to social, emotional, and materialistic influences over one's thoughts and actions.

Apparently it is for this reason that divergent thinking scores are influenced by the instructions of the experimenter (Harrington, 1976), the achievement motivation of the subject (Hocevar, 1980), or the promise of reward (Halpin & Halpin, 1973). By setting problematic conditions which evoke inventive thinking, the divergent task simulates the enterprising environment, and enterprising types are more responsive than creative types, who are inhibited by similar goals or lack of choice in problems (Amabile, 1985).

The relation between problematic conditions and vocational interests appears to work well enough to explain the findings of other researchers as well as results of our study, but our study was also open to

several criticisms. First, the sixth graders may have been too young to have stable vocational interests or understand all of the items on the ACT Interest Inventory. The results may have been some artifact of language level, or may not have validity for older subjects, or the same subjects later in their lives. Second, the number of subjects was not large enough, and the divergent tests not diverse enough, to provide a good test of the relation of divergent fluency to either Business Contact or Creative Arts scales. And third, the instruments used were limited in their value because they did not control for meaningfulness of response, an issue in the measurement of both vocational interests and creativity (Kuder, 1970; Ausubel, 1978).

It is possible to reply to each of these criticisms. First, the unisex edition of the ACT inventory has been reliably used with subjects as young as the eighth grade. Our subjects were tested at the end of the sixth grade, but they were almost all above average, as determined by the Vocabulary subtest of the WISC-R. More concretely, their understanding of the items was demonstrated through the intercorrelations of

four of the six scales. Only values for the Science and Social Service scales did not fit the adult pattern.

Second, although Pattern Meanings and Line Meanings may not be representative tests of divergent thinking, they are among those most closely related to criteria of creativity. This enhanced relationship to creativity is thought to develop through the one-to-one administration in a game-like atmosphere without time limits to constrain the subject. The lack of numbers in our sample was one result of the prolonged, individualized assessments, but another result was a superior indication of divergent-thinking skills, especially if the relationship to creativity is a criterion of the quality of the response.

Third, it was true that there was no control for meaningfulness of response on the divergent-thinking test or the interest inventory, but Wallach and Kogan indicate they had few poorly associated responses on their tests, and our research assistant indicated that the children were absorbed in the inventory task. The one-to-one administration of the divergent tests, and the fact that pupils seemed to respond with intense

interest to the computerized inventory both suggest that insincerity was not a problem in this study.

More difficult to counter is the argument that the correlation between divergent fluency and interest in business contact actually manifests a relationship between verbal fluency and business contact. The law of parsimony would suggest that "invention" is not necessary to explain a relation between verbal fluency and preferences for the activities that employ it. But what of divergent thinking, the cognitive skill these tests are purported to measure? The suggestion that Pattern and Line Meanings measure verbal fluency apart from some problem-solving skill raises questions about divergent thinking tests that go beyond the scope of this study.

To respond meaningfully to this suggestion would also require one to correlate divergent fluency on figural tests with interest in business contact. Assuredly, further work with older subjects and diverse instruments is needed before our conclusion can be definitively established. Verbally-oriented divergent-thinking tests appear to assess a problem-solving skill more strongly related to interest

in persuasive vocations than to interest in the creative arts. We have tentatively identified this problem-solving skill as inventive, as opposed to insightful, logical, or creative. It should be stressed that by distinguishing invention from creativity, we do not suggest that divergent-thinking tests are invalid for the selection of special talent for special educational programs. On the contrary, we argue only for the systematic distinction between different types of problem-finding-and-solving skill, and careful validation of instruments or techniques to assess each type.

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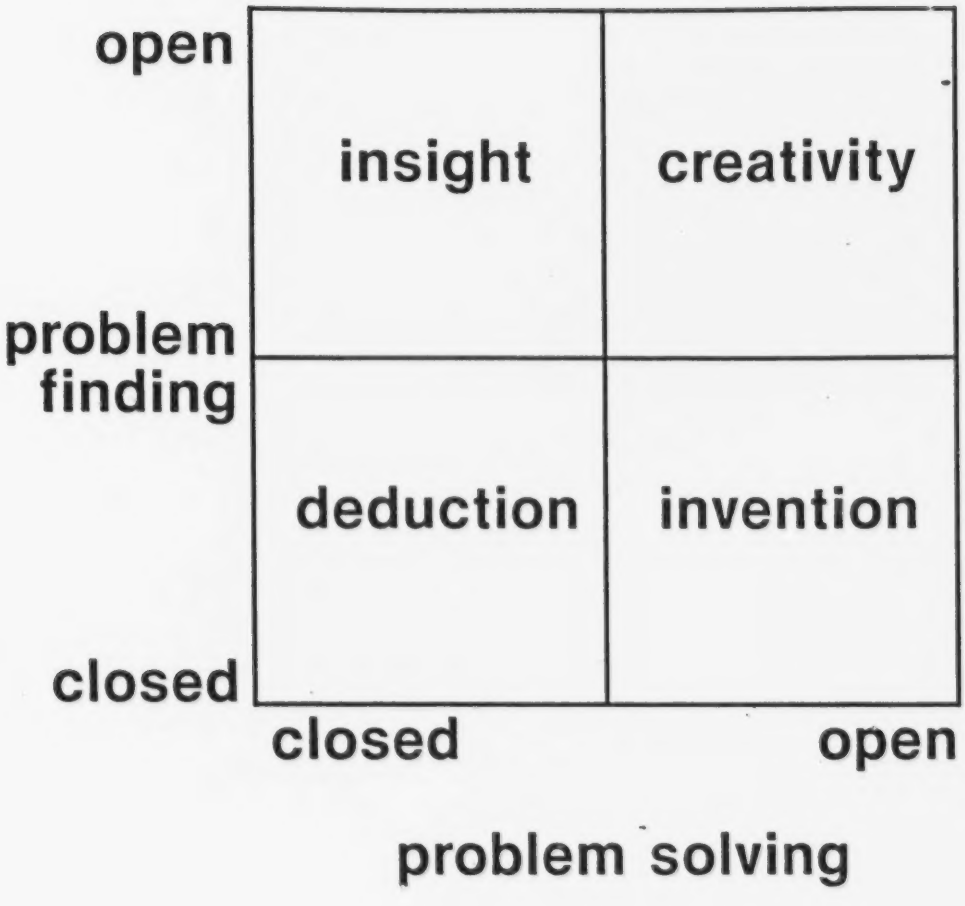
Table 1

Intercorrelations of ACT Interest Scales for 41 Sixth Graders

Interest Scale	Science	Creative Arts	Social Service	Business Contact	Business Organization	Technical
Science	--	-07(32)	-02(29)	12(07)	49(06)	44(36)
Creative Arts		--	34(39)	18(27)	04(-01)	30(39)
Social Service			--	19(51)	18(16)	26(23)
B. Contact				--	65(50)	33(26)
B. Organization					--	41(31)

Note: Correlations (decimal points omitted) in parentheses from UNIACT APP norms sample of 2,940 college-bound males and females (Lamb & Prediger, 1981).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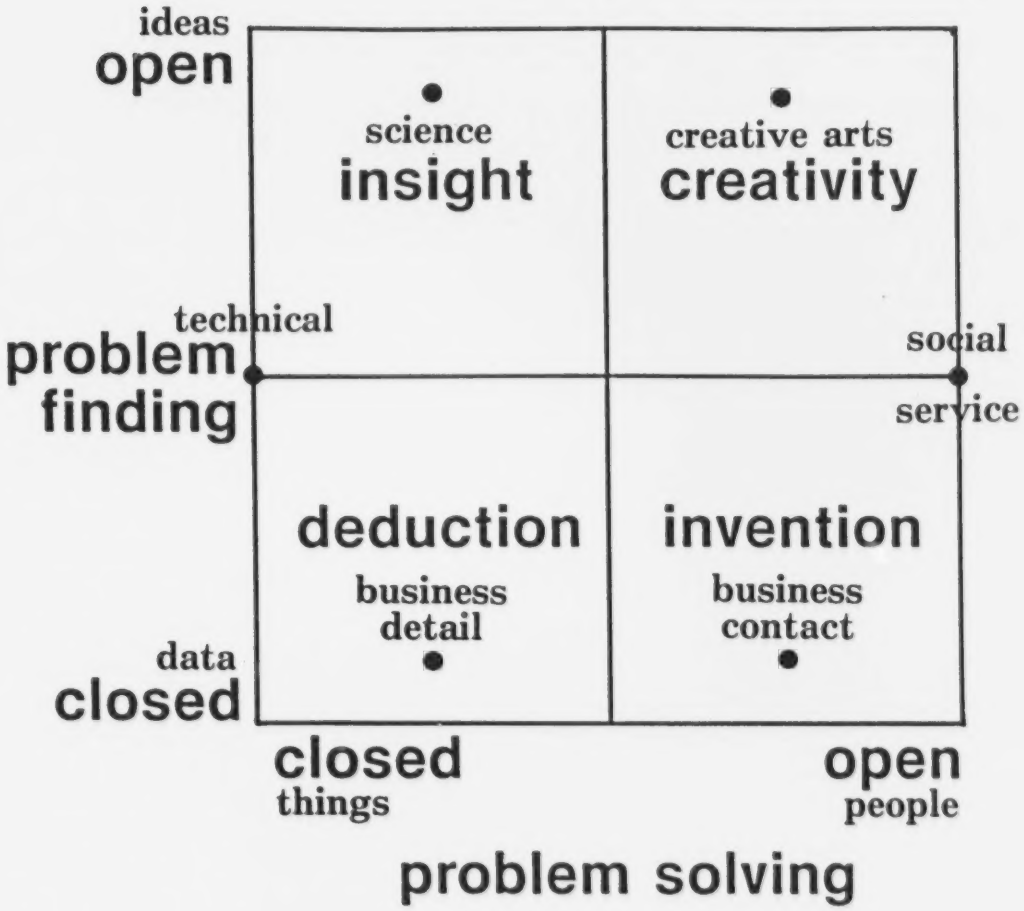
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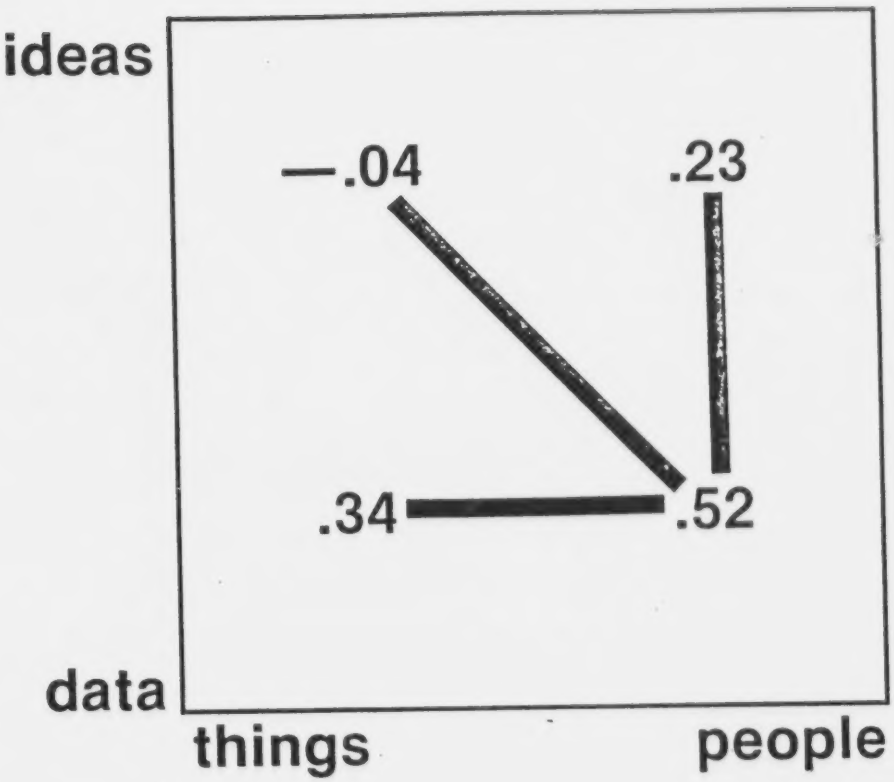
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Figure Captions

Figure 1. Coordination of problem finding and solving conditions

Figure 2. Juxtaposition of cognitive skills and vocational interests

Figure 3. Correlations between divergent fluency and vocational interests